CMSC426 Project 1 Report **Xinyang Li**
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Questions

I. Your choice of color space, initialization method and number of gaussians in the GMM
II. Explain why GMM is better than single gaussian
III. Present your distance estimate and cluster segmentation results for each test image
IV. Explain strengths and limitations of your algorithm.
V. Also, explain why the algorithm failed on some test images

I

I choose RGB for color space because it works fine on all test images starting from 4.jpg. Also, for first three images, both RGB, YCbCr and HSV look terrible. So in the end I decide to choose RGB for color space.
I initialize π for random numbers. And I initialize Σ and μ for random 3*1 matrices. In addition, I multiply 1000 on the random Σ because it is too small and matlab gave me a NAN error (Not A Number).

II

GMM is better than the single gaussian method because GMM selects many clusters to measure. To be more specific, when we use single GMM, we measure each pixel's probability to be in orange color class from just one point (let us call it center). Therefore the possibility that the pixel is in orange class but did not been considered as orange is very high. However, if we use general GMM to measure, we need to select different numbers of cluster which are considered to be orange, and use these clusters to train the model. After this process, if we now apply our trained model to each pixel, the possibility that orange pixels are identified will be much higher. Therefore that is why general GMM is usually better than single GMM.

III

All cluster segmentation results for each test image are in results./ file under xli12311_proj1.zip. And all distance estimates are in distance.mat.

IV

My algorithm has its strengths and limitations. For example, for pictures that the orange ball is big and clear, the algorithm can identify orange ball very well. While for some special cases, with many interferes, it may not identify orange ball very clearly. Also, after testing each images, I found that this algorithm cannot identify the highlight part of the orange ball, which is a limitation of my algorithm.

V

This algorithm seems not to be very successful on the first three test images because in these two test images, apple and tennis ball interfere the algorithm for identifying the right orange color. Also, since the orange ball is too far away from screen, the model cannot be trained very well. Therefore it cannot identify orange class pixel pefectly good.

*Note

We did our single GMM and GMM parts individually and share *measureDepth* part and *plot* part.